WHAT IS CLAIMED IS:

1. A method of generating a theoretical slide displacement curve for a mechanical press, comprising:

 providing an equation that can be utilized to calculate slide displacement as a function of press speed, the equation including variables to account for press parameters which effect slide displacement;

 providing a computational device;

 determining the speed of the press;

 determining the equation variables;

 communicating the equation, the speed of the press and the equation variables to the computational device;

 calculating the theoretical distance above bottom dead center for each increment of a slide stroke; and

 plotting the calculated distance above bottom dead center values vs. time.

2. The method of Claim 1, wherein said step of determining the equation variables comprises:

 determining the appropriate variable corresponding to the press drive mechanism of the mechanical press;

 determining the appropriate variable corresponding to the connecting rod length of the mechanical press;

 determining the appropriate variable corresponding to the stroke length of the mechanical press; and

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determining the appropriate variable corresponding to

the bearing size of the mechanical press.

3. An apparatus for generating a theoretical slide

displacement curve for a mechanical press, comprising:

a speed sensor for sensing a value of press speed;

input means for inputting a plurality of variables

corresponding to characteristics of the press;

storage means for storing an equation which can be used

for generating the theoretical slide displacement curve, said

equation utilizing said plurality of variables corresponding to

characteristics of the press and said value of press speed to

generate the theoretical slide displacement curve; and

computer processor means for generating the theoretical

slide displacement curve, said computer processor means

communicatively connected to said sensor means, said input means

and said storage means.

4. The data processing system as recited in Claim 3,

wherein said plurality of variables comprises:

a value of connecting rod length;

a value of stroke length;

a value of drive type; and

a value of bearing size.

5. A method of monitoring performance parameters for a

mechanical press, comprising:

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generating a theoretical no load slide displacement

curve;

5   generating an actual slide displacement curve during a

load condition of the press;

determining the contact point on the actual slide

displacement curve which corresponds to the slide contacting the

stock material;

10   establishing a start point on the slide downstroke

between top dead center and the contact point;

establishing an end point on the slide upstroke between

top dead center and the contact point;

identifying the points on the theoretical slide

displacement curve corresponding to the start point and the end

point;

identifying the points on the actual slide displacement

curve corresponding to the start point and the end point;

superimposing the identified start points on the

20   theoretical and actual slide displacement curves; and

superimposing the identified end points on the

theoretical and actual slide displacement curves so that the

theoretical and actual slide displacement curves can be compared

to obtain indicators of press performance.

6.   The method of Claim 5, wherein said step of generating a

theoretical no load slide displacement curve comprises:

providing an equation that can be utilized to calculate slide displacement as a function of press speed, the equation including variables corresponding to press drive mechanism, connecting rod length, stroke length, and bearing size;

determining the speed of the press;

determining the appropriate variable corresponding to the press drive mechanism of the mechanical press;

determining the appropriate variable corresponding to the connecting rod length of the mechanical press;

determining the appropriate variable corresponding to the stroke length of the mechanical press;

determining the appropriate variable corresponding to the bearing size of the mechanical press;

providing a computational device;

communicating the equation, the speed of the press and the equation variables to the computational device;

calculating the theoretical distance above bottom dead center for each time increment of a slide stroke; and

plotting the calculated distance above bottom dead center values vs. time.

7. The method of Claim 5, wherein said step of generating an actual slide displacement curve during a load condition of the press comprises:

monitoring the displacement of the slide of the press;

5   and

plotting slide displacement vs. crank angle.

8.   The method of Claim 5, wherein said step of generating an actual slide displacement curve during a load condition of the press comprises:

monitoring the displacement of the slide of the press;

5   and

plotting slide displacement vs. time.

9.   The method of Claim 5, wherein said step of generating an actual slide displacement curve during a load condition of the press comprises:

monitoring the displacement of the slide of the press using a non-contact displacement sensor; and

plotting slide displacement vs. crank angle.

10.   The method of Claim 5, wherein said step of generating an actual slide displacement curve during a load condition of the press comprises:

monitoring the displacement of the slide of the press

5   using a non-contact displacement sensor; and

plotting slide displacement vs. time.

11.   The method of Claim 5, wherein said step of determining the contact point on the actual slide displacement curve comprises:

determining the first inflection point on the actual

5   slide displacement curve; and

establishing the contact point on the actual slide

displacement curve as the first inflection point on the actual

slide displacement curve.

12.   The method of Claim 5, further comprising:

calculating the distance between the theoretical slide

displacement curve and the actual slide displacement curve at a

plurality of increments on the slide upstroke between the contact

5   point and the end point;

calculating the sum of the distances between the

theoretical slide displacement curve and the actual slide

displacement curve at each increment;

shifting the actual slide displacement curve;

10   calculating the sum of the distances between the

theoretical slide displacement curve and the actual slide

displacement curve at each increment; and

repeating the shifting and calculating steps until the

sum of the distances between the theoretical slide displacement

15   curve and the actual slide displacement curve at each increment

reaches a minimum value.

13.   The method of Claim 5, further comprising:

determining a value of dynamic deflection;

determining the value of static stiffness for the press

being monitored;

5   providing a computational device;

communicating the value of dynamic deflection and the

value of static stiffness to the computational device; and

calculating load on the press at any point of the slide

stroke by multiplying the value of dynamic deflection for the

10   relevant point of the slide stroke by the value of static

stiffness.

14.   The method of Claim 13, wherein said step of determining

a value of dynamic deflection comprises:

measuring the distance along the ordinate between the

theoretical no load slide displacement curve and the actual slide

displacement curve.

15.   The method of Claim 14, further comprising:

calculating load on the press for each time increment

of a slide stroke; and

plotting calculated load vs. time.

16.   A method of monitoring load on a mechanical press

without using a contact load sensor, said method comprising:

determining a value of dynamic deflection;

determining the value of static stiffness for the press

5   being monitored;

providing a computational device;

communicating the value of dynamic deflection and the value of static stiffness to the computational device; and

calculating load on the press at any point of the slide stroke by multiplying the value of dynamic deflection for the relevant point of the slide stroke by the value of static stiffness.

17. The method of Claim 16, wherein said step of determining a value of dynamic deflection comprises:

generating a theoretical no load value of slide displacement;

generating a calculated actual load value of slide displacement corresponding in time to the theoretical no load value of slide displacement;

computing the difference between the theoretical no load value and the actual load value of slide displacement; and

establishing the difference between the theoretical no load value and the actual load value of slide displacement as the value of dynamic deflection.

18. The method of Claim 16, further comprising:

determining a plurality of values of dynamic deflection at increments of the entire slide stroke; and

calculating a plurality of load values corresponding to the plurality of dynamic deflection values.

19. The method of Claim 18, further comprising:

generating a plot of load vs. time for a slide stroke

of the press.

20. An apparatus for monitoring a running press, comprising:

a speed sensor for sensing a value of press speed;

input means for inputting a plurality of variables

corresponding to characteristics of the press; and

5   storage means for storing an equation which can be used

for generating the theoretical slide displacement curve, said

equation utilizing said plurality of variables corresponding to

characteristics of the press and said value of press speed to

generate the theoretical slide displacement curve;

10   a computational device for generating the theoretical

slide displacement curve, said computational device

communicatively connected to said sensor means, said input means

and said storage means; and

a non-contact displacement sensor for sensing slide

15   displacement during an actual load condition of the press, said

non-contact displacement sensor communicatively connected to said

computational device, said computational device plotting sensed

slide displacement vs. a count quantity, said computational

device determining the contact point on the actual slide

20   displacement curve which corresponds to the slide contacting the

stock material, said computational device establishing a start

point on the slide downstroke between top dead center and the

contact point, said computational device establishing an end

point on the slide upstroke between top dead center and the

25   contact point, said computational device identifying the points

on the theoretical slide displacement curve corresponding to the

start point and the end point, said computational device

identifying the points on the actual slide displacement curve

corresponding to the start point and the end point, said

30   computational device superimposing the identified start points on

the theoretical and actual slide displacement curves, said

computational device superimposing the identified end points on

the theoretical and actual slide displacement curves so that the

theoretical and actual slide displacement curves can be compared

35   to obtain indicators of press performance.

21.   The apparatus as recited in Claim 20, wherein said

computational device comprises:

        a microprocessor.

22.   The apparatus as recited in Claim 20, wherein said

plurality of variables comprises:

        a value of connecting rod length;

        a value of stroke length;

5   a value of drive type; and

        a value of bearing size.

23.   The apparatus as recited in Claim 20, wherein said count

quantity is a measure of time.

24. The apparatus as recited in Claim 20, wherein said count quantity is a measure of crank angle.

25. An apparatus for monitoring the load on a mechanical press, comprising:

a speed sensor for sensing the speed of the press;

a non-contact displacement sensor for sensing slide displacement during an actual load condition of the press;

input means for inputting a plurality of variables corresponding to characteristics of the press; and

a computational device, said computational device communicatively connected to said speed sensor, said non-contact displacement sensor and said input means, said computational device computing a theoretical no load value of slide displacement, said computational device computing a value of dynamic deflection by computing the difference between the theoretical no load value and the corresponding actual load value of slide displacement, said computational device multiplying the value of dynamic deflection by the value of static stiffness of the mechanical press to determine a value of load on the press at a point of the slide stroke.

26. The apparatus as recited in Claim 25, wherein said plurality of variables comprises:

a value of static stiffness corresponding to the press being monitored;

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5   an equation for generating theoretical slide

displacement values, said equation including variables

corresponding to press drive mechanism, connecting rod length,

stroke length, and bearing size;

    a value of connecting rod length;

10   a value of stroke length;

    a value of drive type; and

    a value of bearing size.